REMARKS

This responds to the Office Action mailed on June 11, 2007. Reconsideration is respectfully requested.

Claims 1, 5, 9, 14, 15, 19, 22, 23, 26, 27, and 29 are amended, no claims are canceled, and no claims are added; as a result, claims 1 – 29 remain pending in this application.

Objections to the Claims

Claim 29 was objected to due to informalities. It is believed that the amendment made herein to claim 29 obviates the objection. Claim 29 has been amended to depend from claim 28.

Allowable Subject Matter

Claims 5, 19, and 26 were objected to as being dependent upon a rejected base claim, but were indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 5 has been rewritten in independent form including all of the limitations of the base claim 1 and is believed to be in condition for allowance.

Claim 19 has been rewritten in independent form including all of the limitations of the base claim 14 and intervening claim 15, and is believed to be in condition for allowance.

Claim 26 has been rewritten in independent form including all of the limitations of the base claim 22 and intervening claim 23, and is believed to be in condition for allowance.

§*102 Rejection of the Claims*

Claims 1, 2, 7-9, 12-15, 20-23, 27 and 28 were rejected under 35 USC § 102(b) as being anticipated by Sudo et al. (EP 1005204 A2).

Applicant's claim 1, as amended, is directed to a parallel-channel frequency-offset estimator. As recited in claim 1, a first autocorrelation element performs a first autocorrelation on a serial symbol stream of training symbols delayed by a ***first*** duration to produce a first correlation output. A second autocorrelation element performs a second autocorrelation on the serial symbol stream delayed by a ***second*** duration to produce a second correlation output. A first moving average element performs a first moving average on the first correlation output for use in

generating a first phase shift estimate. A second moving average element performs a second moving average on the second correlation output for use in generating a second phase shift estimate.

As further recited in claim 1, the autocorrelation elements perform autocorrelations on the ***same*** serial symbol stream. As further recited in claim 1, the first and second durations are ***differing integer multiples of symbol durations***, and the first and second moving averages based on the first and second durations, respectively.

In accordance with claim 1, the autocorrelation elements perform separate autocorrelations in parallel on the ***same*** observation of the serial symbol stream, however the ***amount of delay*** of the symbol stream for each correlation ***is different***. As recited in claim 1, the first and second durations are differing integer multiples of symbol durations. For example, the first phase shift estimate may be a phase shift estimate for a delay of the symbol stream of T (e.g., a one symbol delay) and the second phase shift estimate may be a phase shift estimate for a delay of 2T (e.g., a two symbol delay). Because the delays used by the correlators are different, the duration of the averaging is also different. For example, when the first phase shift estimate is generated using one symbol delay, the first moving average may perform averaging for a time of 1.5T (e.g., 96 samples), and when the second phase shift estimate is generating using a two symbol delay (2T), the second moving average may perform averaging for a time of 0.5T (e.g., 32 samples). The first and second phase shift estimates may be different because different pairs of samples of the same observation are used by the correlation elements. The different phase shift estimates may be weighted accordingly and combined to produce a more accurate frequency offset estimate.

Applicant's other independent claims 14, 22, and 27 have recitations similar to that of claim 1.

Claim 3, for example, recites that the first duration is a duration of one of the training symbols, and the second duration is twice the first duration, the first moving average element performs the first moving average over approximately one and a half durations, and the second moving average element performs the second moving average over approximately one-half durations on the second correlation output.

In Sudo, both perform frequency offset estimation of ***different observations*** of received symbols. Sudo shows separately received signals referred to as "RECEIVED SIGNAL 1" and "RECEIVED SIGNAL 2" in FIG. 2 and in FIGs. 8 – 11. As described in the associated text, these are separately received signals (see Sudo paragraph [0013], as well as others).

Kim (referenced below) also uses ***different observations*** of received symbols. For example, Kim states that "Multiple observations of a symbol are obtained from multiple antenna paths in a wireless receiver" (see Kim Abstract). Applicant's find no teaching, suggestion or motivation in either Sudo or Kim, to perform parallel operations on different observations of the same serial symbol stream.

Applicant's claim 1 recites the use of the ***same*** symbol stream which is illustrated in Applicant's FIG. 1 as serial symbol stream 201 that is provided to both correlation elements 216 and 226. The use of the term "two-channel" in Applicant's specification refers to two signal processing paths. Sudo and Kim, on the other hand, use two-separately received signals.

Applicant's claim 1 further distinguishes over Sudo by reciting that the symbol stream is delayed by first and second durations that are differing integer multiples of the symbol duration. Sudo's delay elements (#13 and #14 of FIG. 1) both provide the same delay of one symbol (see Sudo paragraph [0020], among other places throughout Sudo).

Accordingly, Applicant submits that Sudo does not anticipate Applicant's claimed invention and that the rejection of claims 1, 2, 7-9, 12-15, 20-23, 27 and 28 under 35 U.S.C. § 102(b) has been overcome. Applicants further submit that the combination of Sudo and Kim does not result in Applicant's claimed invention because:

1) Neither reference discloses performing autocorrelations on the ***same*** received serial symbol stream;

2) Neither reference discloses performing autocorrelations correlations on the same received serial symbol stream that are delayed, respectively, by first and second durations having ***differing integer multiples of symbol durations***; and

3) Neither reference discloses performing first and second moving averages based on the first and second durations, respectively (Sudo's integrators 16 and 17 shown in FIG. 2 of Sudo are identical).

§103 Rejection of the Claims

Claims 4, 6, 16, 18, 25 and 29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sudo et al. and further in view of Kim et al. (U.S. 2003/0123582 A1).

Claims 3, 10, 11, 17 and 24 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Sudo et al. and further in view of Bohnke (U.S. 6,731,594 B1).

Claims 4, 6, 16, 18, 25 and 29 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Sudo et al. and further in view of Rinne (U.S. 5,987,063).

Kim has been cited by the Examiner regarding claim 4 for disclosing a phase-correction element that adjusts a phase shift estimate of a multiple of 2π, however the combination of Kim and Sudo does not result in Applicants claimed invention for the reasons discussed above. Therefore, Applicant submits that the rejection of claims 4, 6, 16, 18, 25 and 29 under 35 U.S.C. § 103(a) as being unpatentable over Sudo et al. and further in view of Kim et al, has been overcome.

Bohnke has been cited by the Examiner for disclosing an incoming signal that is delayed by an amount L1 for a first correlation and twice that amount for a second correlation. According to the Examiner, it would be obvious to incorporate this feature of Bohnke in Sudo for detecting frequency offset (see page 9 of the Office Action). Applicant submits that since Sudo performs correlations on two different separately received signal paths, the combination of Bohnke and Sudo still would not result in Applicant's claimed invention. Furthermore, since Sudo simply averages the frequency estimates (e.g., see FIG. 2 averager 30) from both of the separately received signal paths, a ***less accurate*** frequency offset estimate will be generated because of the differences in the delay of each path (if Bohnke were to be incorporated into Sudo).

Furthermore, in Bohnke the correlation outputs are summed in elements 38 and 39 prior to performing a moving average in element 40 (see Bohnke FIG. 6 and column 6 lines 14 – 34). Bohnke's Figs. 7 and 8 are similar to FIG. 6 in this manner. Bohnke uses a ***single*** moving average element 40 to perform a moving average on the ***sum of all correlations***. Applicant's claim 1, for example, recites ***separate*** moving average elements that perform moving averages on the different correlation outputs. As recited in claim 1, the first and second moving averages

are different and based on the first and second durations, respectively. This is not the case in Bohnke which uses a single moving average element for ***all*** correlations. Accordingly, Applicant submits that the rejection of claims 3, 10, 11, 17 and 24 under 35 U.S.C. § 103(a) as being unpatentable over Sudo et al. and further in view of Bohnke has been overcome.

Rinne has been cited by the Examiner regarding claim 4 (for example) for disclosing a phase-correction element that adjusts a phase shift estimate of a multiple of 2π, however the combination of Rinne and Sudo does not result in Applicant's claimed invention at least the reasons discussed above with respect to Sudo. Accordingly, Applicant submits that the rejection of claims 4, 6, 16, 18, 25 and 29 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Sudo et al. and further in view of Rinne has been overcome.

RESERVATION OF RIGHTS

In the interest of clarity and brevity, Applicant may not have addressed every assertion made in the Office Action. Applicant's silence regarding any such assertion does not constitute any admission or acquiescence. Applicant reserves all rights not exercised in connection with this response, such as the right to challenge or rebut any tacit or explicit characterization of any reference or of any of the present claims, the right to challenge or rebut any asserted factual or legal basis of any of the rejections, the right to swear behind any cited reference such as provided under 37 C.F.R. § 1.131 or otherwise, or the right to assert co-ownership of any cited reference. Applicant does not admit that any of the cited references or any other references of record are relevant to the present claims, or that they constitute prior art. To the extent that any rejection or assertion is based upon the Examiner's personal knowledge, rather than any objective evidence of record as manifested by a cited prior art reference, Applicant timely objects to such reliance on Official Notice, and reserves all rights to request that the Examiner provide a reference or affidavit in support of such assertion, as required by MPEP § 2144.03. Applicant reserves all rights to pursue any cancelled claims in a subsequent patent application claiming the benefit of priority of the present patent application, and to request rejoinder of any withdrawn claim, as required by MPEP § 821.04.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney ((480) 659-3314) to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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